

PROBLEM SET 10: INCLUSION EXCLUSION PRINCIPLE

1. Suppose there are 200 first-year students, 100 of whom are taking Calculus and 70 of whom are taking Algebra. If there are 50 first-year students that are taking both Calculus and Algebra, how many first-year students are taking neither course?
2. In a survey on the chewing gum preferences of soccer players, it was found that 22 like fruit, 25 like spearmint, 39 like grape, 9 like spearmint and fruit, 17 like fruit and grape, 20 like spearmint and grape, 6 like all flavors, 4 like none. How many players were surveyed?
3. How many integers between 1 and 10000 (inclusive) are divisible by 3 or 5?
How many are divisible by 3, 5 or 7?
4. Of a hundred volunteers who filled out questionnaires about their viewing habits over the past year:
(i) 28 watched gymnastics (ii) 29 watched baseball (iii) 19 watched soccer (iv) 14 watched gymnastics and baseball (v) 12 watched baseball and soccer (vi) 10 watched gymnastics and soccer (vii) 8 watched all three sports. How many watched none of the three sports?
5. In a mathematics department of size 40, faculty are members of four different professional organizations: NCTM (N), MAA (M), AMS (A), and SSMA (S). We know that 21 are members of NCTM, 26 are MAA members, 19 belong to AMS, and 17 are in SSMA. In addition, we know that 15 are in both NCTM and MAA, 6 are in NCTM and AMS, 9 are in NCTM and SSMA, 14 are in MAA and AMS, 10 are in MAA and SSMA, and 11 are in AMS and SSMA. We also know that 6 are in NCTM, MAA, and AMS, 5 are in NCTM, MAA, and SSMA, 4 are in NCTM, AMS, and SSMA, and 9 are in MAA, AMS, and SSMA. finally, 4 people belong to all four organizations. How many faculty members belong to none of these organizations?
6. A 'derangement' of the sequence 1, 2, 3, 4 is a rearrangement of the sequence such that integer j is not placed in the j^{th} position (where $j = 1, 2, 3, 4$). How many *derangements* of 1, 2, 3, 4 exist?
Can you generalize this to a sequence of length 5 or 6? What about n ?
7. If time permits, solve some of the exercises on page 208 of the text.

A lot of widows feel that they have betrayed their spouse by continuing to live. It's deranged thinking. I know that, but that doesn't stop you feeling it.

- Joyce Carol Oates